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10/656,478	09/05/2003	Hassan Mostafavi	2018721-7031422002; 03-00	8695
55499 7590 06/13/2007 VARIAN MEDICAL SYSTEMS TECHNOLOGIES, INC. c/o BINGHAM MCCUTCHEN LLP THREE EMBARCADERO CENTER SAN FRANCISCO, CA 94111-4067			EXAMINER ALLISON, ANDRAE S	
			ART UNIT 2624	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/656,478

Applicant(s)

MOSTAFAVI, HASSAN

Examiner

Andrae S. Allison

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-57 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-57 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 6/1/2007.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Remarks

1. The Office Action has been issued in response to amendment filed January 19, 2007. Claims 1-19 are pending. Applicant's arguments have been carefully and respectfully considered in light of the instant amendment, and some are persuasive.

Claim Objection

The claims have been corrected to overcome the objection. Therefore, the objection has been removed.

Response to 112 Rejection Arguments

Claims 35-41 have been amended to provide antecedent basis for all claim terms. Therefore, the rejection has been removed.

Response to 102 Rejection Arguments

In response to applicant's argument, on page 9 [p][004] and page 10 [p][001] that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., such that an image of a moving object is enchainned relative to an image of relatively stationary object) are not recited in the rejected claims. Although the claims are interpreted in light of the specification,

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limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to Applicant's argument on page 10, [p][002-003], that Hildreth failed to disclose the limitation "reference image of an object", the Examiner agreed. The basic premise of the invention is taught by the Hildreth, in that multiple difference or composite images are used to track the position of an object or target, but Hildreth did not specifically mention the reference image of an object. Therefore, the rejection is withdrawn, however, new grounds of rejection is presented.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claim 1-3, 7-9, 12-14, 18, 20, 23-27 and 31-36 are rejected under 35

U.S.C. 102(e) as being anticipated by Hipp by (US Patent Application No.: 2003/0086596).

As to claim 1, Hipp discloses a method of determining a position of a target region (track the position of a specific vertebra, [0035], lines 1-3) in a medical procedure (clinical assessment of spinal stability, [0002], lines 1-2), comprising: acquiring an input

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image of a target region (see Fig 4a); enhancing a feature of the input image ([0035], lines 5-7) such that an image of a moving object is enchained relative to an image of relatively stationary object (note that the background is usually stationary, therefore the object would be enhanced relative to the a relatively stationary object, see Fig 4a); registering the input image with a template; and determining a position of the target region in the input image based on the registering (see [0042], lines 11 -15, where the input image is registered with a search model or template to locate similar regions in the input image).

As to claim 22, all the limitations are discussed in claim 1 above except means for enhancing a moving object in the input image (note that the vertebrae has muscle attach to it causing it to move ([0004], lines 3-5). Also, claim 22 differ from claim 1 only in that claim 22 is a system claim whereas claim is 1 method claim. Thus, claim 22 is analyzed as previously discussed with respect to claim 1 above.

As to claim 31, all the limitations are discussed in claim 1 above except "set of instruction" is additively recited in the preamble and the limitation "means for enhancing a moving object in the input image". Hipp teaches a computer readable medium comprising: set of instruction (software, [0027], line 7) and means for enhancing a moving object in the input image (note that the vertebrae has muscle attach to it causing it to move ([0004], lines 3-5). Also, claim 30 differ from claim 1 only in that claim 30 is a computer readable medium claim whereas claim is 1 method claim. Thus, claim 30 is

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analyzed as previously discussed with respect to claim 1 above.

As to claim 2, Hipp teaches the method wherein the enhancing comprises determining a composite image of previously acquired input images ([0040], lines 4-11).

As to claim 3, Hipp teaches the method wherein the determining a composite image comprises performing an image averaging on the previously acquired input images (see [0040], lines 4-11, where adjacent images are averaged which includes previously acquired images).

As to claim 7, Hipp teaches the method further comprising selecting the template from a plurality of templates ([0046], lines 1-3).

As to claim 8, Hipp teaches the method wherein the selecting comprises choosing a template from the plurality of templates that best matches at least a portion of the input image (see [0046], lines 6-9).

As to claim 9, Hipp teaches wherein the selecting comprises: comparing the input image with at least a subset of the templates; and selecting the template that best matches at least a portion of the input image (see [0046], lines 6-9).

As to claim 12, Hipp teaches the method wherein the determining a position of the target region comprises determining a position of the image in the input image that best matches the template (see column 4, lines 1-3, where the rotation and translation of the template that gives the best match describes the position of the target area).

As to claim 13, Hipp teaches the method wherein the input image comprises a fluoroscopic image (e.g. radiographic images; [0042], lines 9).

As to claim 14, Hipp teaches the method further comprising performing a medical procedure based on the determined position of the target region (e.g. clinical assessment of spinal stability, [0002], lines 1-2).

As to claim 18, Hipp teaches the method wherein the target region comprises at least a part of an animal body (e.g. vertebrae; [0027], line 3).

As to claim 20 Hipp teaches a method wherein the at least a portion of an animal body comprises a bone (e.g. vertebrae; [0027], line 3).

Claim 23 differ from claim 2 only in that claim 22 is a system claim whereas, claim is 2 method claim. Thus, claim 23 is analyzed as previously discussed with respect to claim 2 above.

Claim 24 differ from claim 7 only in that claim 24 is a system claim whereas, claim is 7 method claim. Thus, claim 24 is analyzed as previously discussed with respect to claim 7 above.

Claim 25 differ from claim 8 only in that claim 25 is a system claim whereas, claim is 8 method claim. Thus, claim 25 is analyzed as previously discussed with respect to claim 8 above.

Claim 26 differ from claim 13 only in that claim 26 is a system claim whereas, claim is 13 method claim. Thus, claim 26 is analyzed as previously discussed with respect to claim 13 above.

Claim 27 differ from claim 14 only in that claim 27 is a system claim whereas, claim is 14 method claim. Thus, claim 27 is analyzed as previously discussed with respect to claim 14 above.

Claim 32 differ from claim 2 only in that claim 32 is a computer readable medium claim whereas, claim is 2 method claim. Thus, claim 32 is analyzed as previously discussed with respect to claim 2 above.

Claim 33 differ from claim 7 only in that claim 33 is a computer readable medium claim whereas, claim is 7 method claim. Thus, claim 33 is analyzed as previously discussed with respect to claim 2 above.

Claim 34 differ from claim 8 only in that claim 34 is a computer readable medium claim whereas, claim is 8 method claim. Thus, claim 34 is analyzed as previously discussed with respect to claim 8 above.

Claim 35 differ from claim 13 only in that claim 35 is a computer readable medium claim whereas, claim is 13 method claim. Thus, claim 35 is analyzed as previously discussed with respect to claim 13 above.

Claim 36 differ from claim 14 only in that claim 36 is a computer readable medium claim whereas, claim is 14 method claim. Thus, claim 36 is analyzed as previously discussed with respect to claim 14 above.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 40, 43, 46, 49, 50, 53 and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Holliman et al (US Patent No.: 6,075,557).

As to claim 40, Holliman discloses a method of monitoring a position of an object (image tracking method, column 1, lines 5-6), comprising: providing a reference image of the object (45, template, see Fig 12); acquiring a first image of the object (48, acquire image, see Fig 12); determining a first composite image based on the reference image and the first image (49, match template and acquired image; also note that a differential movement method is used, see column 11, lines 33-38); and determining whether the object has moved based at least on the first composite image (50, determine if object has moved base on a threshold value, see Fig 12)

As to claim 43, Holliman teaches a method further comprising: acquiring a second image of the object; determining a composite image based on the second image and the reference image; and determining whether the object has moved based at least on the second composite image (note that the matching method is iterative, see Fig 12).

As to claim 46, Holliman teaches the method wherein the object comprises at least a portion of an animal body (see Fig 13).

As to claim 49, Holliman teaches the method further comprising enhancing a moving object in the first image (see column 16, lines 19-49, where Prewitt edge detectors are used to enhance the object).

Claim 50 differ from claim 40 only in that claim 50 is a system claim whereas, claim is 40 method claim. Thus, claim 50 is analyzed as previously discussed with respect to claim 40 above.

As to claim 53, note the discussion of claim 40 above, all the limitations are address except the limitation "a computer readable medium having a set of stored instructions" are additively recited in the preamble. Holliman teaches a computer readable medium (39, memory) having a set of stored instructions.

Claim 56 differ from claim 49 only in that claim 56 is a computer readable medium claim whereas claim is 49 method claim. Thus, claim 56 is analyzed as previously discussed with respect to claim 49 above.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hipp by (US Patent Application No.: 2003/0086596).

As to claim 21, Hipp teaches the method of claim 1, wherein the target region comprises at least a part of a non-animal object. Although, Hipp does not specifically disclose the target region being part of a non-animal object, it would have been obvious that the system is capable of determining the position of a target region of non-animal objects, such system used in taking and aligning X-ray image or for targets like radioactive elements or dye, all of which are very conventional in the processing and analysis of medical images (Official Notice).

8. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hipp by (US Patent Application No.: 2003/0086596) in view of Ito (US Patent No.: 5,535,289).

As to claim 6, Hipp does not teach the method wherein the enhancing further comprises subtracting the composite image from the input image. Ito teaches a method for reducing noise in subtracted image (column 2, lines 1-3) including the step of subtracting the composite image from the input image (see Fig 1a). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added the method of reducing noise of Ito to the method of identifying and tracking motion of Hipp for reducing noise in image data whereby enhancing the image

data because noise reduction is a basic process in image analysis and processing and makes for better image.

As to claim 6, note the discussion above, Ito teaches the method wherein the image averaging is performed based on a weighted average (column 3, line 23-27).

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hipp by (US Patent Application No.: 2003/0086596) in view of Holm (US Patent No.: 6,563,945).

As to claim 5, Hipp does not teach the image averaging is performed using a boxcar averaging technique. Holm teaches a method for tone and color reproduction (column 1, lines 14-15) wherein image averaging is performed using a boxcar averaging technique (column 7, lines 17-18). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added the method for tone and color reproduction of Holm to the identifying and tracking motion of Hipp for blurring or smoothing image data.

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hipp by (US Patent Application No.: 2003/0086596) in view of Rafter et al (Pub No.: 2004/0077952).

As to claim 10, Hipp does not teach the method wherein the selecting comprises comparing the input image with the template that is generated at approximately a same time-point or a same phase of a physiological cycle as the input image. Rafter teaches

a method for controllably arranging a plurality of images ([0022], lines 2-3) including comparing the input image with the template that is generated at approximately a same time-point or a same phase of a physiological cycle as the input image (see [0105], where motion loop images, for e.g. image acquired during systolic or diastolic of a patient heart cycle, are synchronized compared and use for diagnostic purposes). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added the method for controllably arranging a plurality of images of Rafter to the identifying and tracking motion of Hipp to enable a diagnostician to compare tissue movement throughout a patient's heart cycle over different stages of stress [0105].

11. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hipp by (US Patent Application No.: 2003/0086596) in view of Weese et al (US Patent No.: 7,062,078).

As to claim 11, Hipp does not teach the method wherein the selecting comprises: determining a previously registered template ; and comparing the input image with the template next in line to the previously registered template. Weese teaches a method of registering a series of images (column 1, lines 1-2) including determining a previously registered template(column 3, lines 64-65) ; and comparing the input image with the template next in line to the previously registered template (column 3, line 67 and column 4, lines 1-2). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added the method of

registering a series of images of Weese to the method of identifying and tracking motion of Hipp "for the registration of arbitrary temporally successively acquired images of the same object for which a high accuracy is required in order to compensate notable for motion of the object" (column 6, lines 30-35).

12. Claims 15-17, 19, 28-30 and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hipp by (US Patent Application No.: 2003/0086596) in view of Baker (Pub No.: 2003/0026758).

As to claim 15, Hipp does not teach wherein the medical procedure comprises directing a radiation beam to an object. Baker teaches a method for monitoring a target area ([0004], lines 1-2) including the step of directing a radiation beam to an object ([0030], lines 3-4). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added the method for monitoring a target area of Baker to the identifying and tracking motion of Hipp for tracking changes in position of a target area in real time ([0013], lines 3-6).

As to claim 16, note the discussion above, Baker teaches a method wherein the performing the medical procedure comprises changing a direction of a radiation beam in response to the determined position (see [0034], lines 8-12, where the direction of the radiation beam is changed in response to the changed in the position of the target region).

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As to claim 17, note the discussion above, Baker teaches the method wherein the performing the medical procedure comprises gating a delivery of the radiation beam in response to the determined position (see [0034], lines 12-15, where the radiation beam is turned on or off in response to a changed in the position of the target region).

As to claim 19, note the discussion above, Baker teaches the method wherein the at least a part of an animal body comprises a lung tissue ([0037], line 7).

Claim 28 differ from claim 15 only in that claim 28 is a system claim whereas, claim is 15 method claim. Thus, claim 28 is analyzed as previously discussed with respect to claim 15 above.

Claim 29 differ from claim 16 only in that claim 29 is a system claim whereas, claim is 16 method claim. Thus, claim 29 is analyzed as previously discussed with respect to claim 16 above.

Claim 30 differ from claim 17 only in that claim 30 is a system claim whereas, claim is 17 method claim. Thus, claim 30 is analyzed as previously discussed with respect to claim 17 above.

Claim 37 differ from claim 15 only in that claim 37 is a computer readable medium claim whereas, claim is 15 method claim. Thus, claim 37 is analyzed as previously discussed with respect to claim 15 above.

Claim 38 differ from claim 16 only in that claim 38 is a computer readable medium claim whereas, claim is 16 method claim. Thus, claim 38 is analyzed as previously discussed with respect to claim 16 above.

Claim 39 differ from claim 17 only in that claim 39 is a computer readable medium claim whereas, claim is 17 method claim. Thus, claim 39 is analyzed as previously discussed with respect to claim 17 above.

13. Claims 41, 42, 44, 45, 51, 52, 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holliman et al (US Patent No.: 6,075,557).in view of Lo et al (US Patent No: 5,109,435).

As to claim 41 Holliman did not teach the method further comprising determining a first value associated with a contrast of the first difference image. Lo teaches a method of detecting moving objects (column 1, lines 10-11) that includes determining a first value (median value, column 1, line 63) associated with a contrast of the first difference image (note that the median value calculated from the pixel values in registered images and is therefore associated with the contrast, column 1, lines 63-65). Therefore it would have been obvious to one of ordinary skill in the art at the time the

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invention was made to have added the method of detecting moving objects of Lo to the image tracking method of Holliman for determining the position of a moving object especially in cases where background cluster is present (column 1, lines 55-58).

As to claim 42, note the discussion above, Lo teaches the method wherein the determining whether the object has moved is performed based on the first value (note that the median pixel values are subtracted from image frames to form a difference image, then thresholds are applied to the difference image to determine the position of a moving object, columns 1, line 65-68 and column 2, lines 1-2).

As to claim 44, note the discussion above, Lo teaches the method of further comprising determining a second value associated with a contrast of the second composite image (see column 7, lines 28-32, where a new median value is calculated for an additional frame).

As to claim 45, note the discussion above, Lo teaches the method wherein the determining whether the object has moved is performed based on the second value (note that this new median value is used to determine the position of the moving object, column 7, lines 33-34).

Claim 51 differ from claim 41 only in that claim 51 is a system claim whereas, claim is 41 method claim. Thus, claim 51 is analyzed as previously discussed with respect to claim 41 above.

Claim 52 differ from claim 42 only in that claim 52 is a system claim whereas claim is 42 method claim. Thus, claim 52 is analyzed as previously discussed with respect to claim 42 above.

Claim 54 differ from claim 41 only in that claim 54 is a computer readable medium claim whereas, claim is 41 method claim. Thus, claim 54 is analyzed as previously discussed with respect to claim 41 above.

Claim 55 differ from claim 42 only in that claim 55 is a computer readable medium claim whereas, claim is 42 method claim. Thus, claim 55 is analyzed as previously discussed with respect to claim 42 above.

As to claim 57, Holliman teaches the method wherein the reference image and the first image are obtained from a same imaging direction relative to the object (note that the first image is captured immediately are the template image thus the images are capture from a same imaging direction, see column 6, lines 23-52).

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14. Claims 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holliman et al (US Patent No.: 6,075,557) in view of Hipp by (US Patent Application No.: 2003/0086596).

As to claim 47, Holliman does not teach method wherein the at least a portion of an animal body comprises a bone. Hipp teaches a method of identifying and tracking motion ([0035], lines 1-3) including wherein the at least a portion of an animal body comprises a bone (e.g. vertebrae; [0027], line 3). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added method of identifying and tracking motion of Hipp to the image tracking method of Holliman for accessing the motion of an object by identifying its position in an initial frame and tracking its position in subsequent frames ([0102] lines 5-10).

As to claim 48, note the discussion above, Hipp teaches the method wherein the first image comprises a fluoroscopic image (e.g. radiographic images; [0042], lines 9).

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Conclusion

The prior art made part of the record and not relied upon is considered pertinent to applicant's disclosure.

Banh et al (US Patent No.: 5,150,426) is cited to teach a method for detecting an object of interest.

Doi et al (US Patent No.: 5,982,915) cited to teach a method detecting internal changes in chest radiographs.

Inquires

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrae S. Allison whose telephone number is (571) 270-1052. The examiner can normally be reached on Monday-Friday, 8:00 am - 5:00 pm, EST.

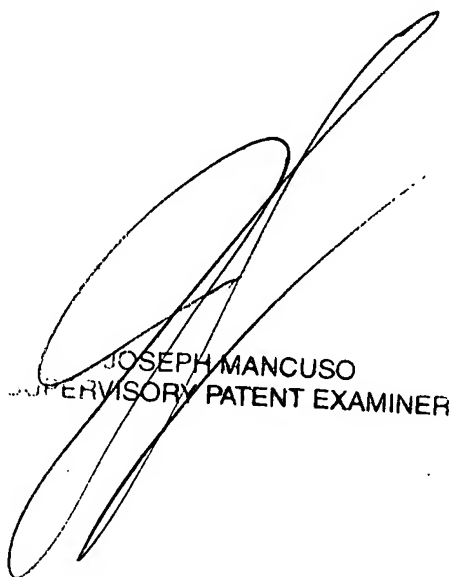
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on (571) 272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Andrae Allison

June 8, 2007

A.A.



JOSEPH MANCUSO
SUPERVISORY PATENT EXAMINER